Appendix G. Radon.

G-1. What is Radon?

Radon-222 (or "radon") is a naturally-occurring, chemically inert, radioactive gas. It is odorless, invisible, and without taste; thus, it cannot be detected with the human senses. Radon can move easily through very small spaces (such as those between particles of soil and rock) and it is moderately soluble in water.

Radon is produced from the radioactive decay of the element radium. Radium is a decay product of the naturally occurring elements uranium and thorium. Radon has a half-life of 3.8 days and, therefore, has enough time to diffuse through dry, porous soils or to be transported in water for a considerable distance before it decays.

The health hazard associated with radon itself is small since the majority of the radon that is inhaled is also exhaled. Radon decays, however, into four daughter products which can attach themselves to dust particles in the air. When these dust particles are inhaled, they may be trapped in the lungs and irradiate the lung tissue. Lung cancer is the only known health hazard associated with exposure to elevated levels of radon gas.

G-2. EPA's Action Level.

In December 1984, the Watra's home in Pennsylvania drew national attention when it was accidentally discovered to have a radon level of > 2000 picocuries per liter of air (pCi/l). Scientists investigating the home determined that naturally occurring radon in the soil resulted in the extremely high indoor radon level. Soon after this discovery, EPA efforts were underway to research indoor radon levels nationwide. In 1986, EPA issued "A Citizen's Guide to Radon: What It Is and What to do About It." In this guide, EPA recommends that the annual average radon concentration in lived-in areas of a home be þ 4 pCi/l. That is, EPA's recommended "action level" is 4 pCi/l.

G-3. Radon Measurement Techniques.

EPA has issued numerous reports describing radon measurement techniques and strategies. Briefly, EPA protocols specify that a short-term, screening measurement be initially performed on the lowest level of a structure with the test device placed in the 'breathing zone' (for example, on a table) and away from sources of humidity such as showers. The

screening measurement should be conducted under “closed-house” conditions (that is, windows and doors closed except for normal entry and exit). Air exchange systems, such as attic fans, should not be operating. The test should be postponed if severe storms with high winds are expected during the test period.

Testing under the aforementioned conditions is considered a “worst case” scenario. If the screening measurement indicates the potential for an elevated radon concentration, a long-term follow-up measurement is performed.

It should be noted that EPA’s testing protocols are applicable for typical residential dwellings. It is recommended that an HP be consulted before testing other types of structures.

Short-term measurements may be made utilizing a charcoal canister (a 2 to 7 day test) or an alpha-track detector (usually, a 3-month test). Long-term measurements may also be made with an alpha track detector (a 12-month test).

Radon measurement devices should be analyzed by a laboratory which has been determined proficient by the US EPA Radon Measurement Proficiency Program.

G-4. Radon Mitigation Techniques.

Radon enters a structure at a rate determined by the availability of radon at the exterior, the number and size of entry routes, and the pressure differential between indoors and outdoors. Mitigation techniques can prevent radon entry into occupied spaces by manipulating pressure relationships and/or by closing entry routes.

Soil depressurization involves the creation of a negative pressure field in the soil outside the structure so that the direction of airflow is from the interior to exterior. This is typically accomplished by using sub-slab suction.

Entry routes may be sealed by covering exposed earth (sumps, drain areas, etc.) and sealing cracks in floors or walls where radon can enter (utility pipe openings, holes in top row of concrete blocks, floor drains, etc.).

G-5. DA and USACE Radon Programs.

Both DA and USACE have adopted EPA’s recommended action level as an indoor radon standard. AR 200-1, Chapter 11 establishes a program for measuring indoor radon in existing buildings on Army installations and in buildings

owned or leased by the Army. The USACE Radon Program, developed in conjunction with, and a mirror of AR 200-1, Chapter 11, can be found in Memorandum, Subject: Guidance for Radon Assessment and Mitigation for the U.S. Army Corps of Engineers (USACE) Civil, Research and Development and Military Missions.

G-6. Agreement State requirements.

Many Agreement States have promulgated regulations which pertain to radon measurement professionals/businesses and radon mitigation professionals/businesses. It is recommended that, if testing/mitigation is to be done on property determined to be under state jurisdiction, it be determined whether there are state regulations with which USACE must comply.